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Book review

Should we risk it? Exploring environmental, health, and technological problem solving.
Daniel M. Kammen and David M. Hassenzahl, Princeton University Press, Princeton, NJ, 1999, xx + 404 pp., illus., US$ 39.50, ISBN 0-691-00426-9 (Cloth).

Risk assessment and management is increasingly permeating almost any discipline in which decisions have to be made regarding human well–being. A diverse array of government agencies in developed countries regulates the use of substances in foods and medicines, and the production, transportation, and emission into the environment of potentially harmful products. Risk analysis is at the core of procedures from which intervention management and regulations eventually emerge. Most NGOs follow similar procedures for their assistance and relief policies for developing economies. Financial risk analysis companies are mushrooming all over the world. Although far less developed, risk assessment is also inching its way into the ecological arena. Risk analysis is right in the middle of the swampy issue of deriving policy from science, just one step before the point where values, preferences, attitudes, and beliefs merge with applied science to produce management policies and regulations (i.e. where 'the rubber meets the road').

To a degree, risk analysis still looks like a host of diverse problem-solving techniques in search of a paradigm. There is a lack of good, comprehensive textbooks, apt for teaching to a diverse audience. Kammen and Hassenzahl claim such a deficiency as main motivation for writing a book on risk-related issues.

Should we risk it? is arranged into Preface and Acknowledgments sections, ten chapters, three appendices containing statistical tables, and index. The book is written to serve both as a college or introductory graduate-level textbook and as a trade book for environmental professionals. Problems (some of them qualifying as case studies) are liberally distributed throughout the book. Each chapter presents many worked examples and offers additional unsolved problems. The range of topics discussed in most chapters is wide and the depth of analysis inevitably limited in many cases. Notable exceptions are subject areas that obviously reflect the authors' own expertise. Nevertheless, the authors have done a successful job at addressing such a broad subject using just ten chapters. In general, the book is clearly written, most figures are simple, well–designed, and appropriate to the subject matter. Both the English and SI systems are used (and mixed) in examples throughout the book.

The Preface and the Introduction were interesting reading. The authors did a good job in presenting the rationale for writing the book, and a comprehensive, almost philosophical view of the field. The Introduction also sets the tone for the rest of the book by presenting, albeit at an elementary level, the first set of problems.

Chapter 2 introduces modeling and models, mainly stock-flow and dose-response models and applications (e.g. physiologically-based pharmacokinetic models), and combinations of those. The topics of model parameterization and sensitivity analysis are also examined in this chapter. Examples cover volatile emissions, indoor radon exposure, pharmacodynamics of ingested substances, earthquake fatalities, etc.

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Chapter 3 was apparently intended as a review chapter on statistics. It covers a few topics on elementary statistics (mean, median, variance, a few distributions, hypothesis testing, model fitting), most of them illustrated with numerical examples. The authors recommend a basic statistics class as a prerequisite for the novice. However, this does not mean that the reader with an elementary statistics background will comfortably wade through every topic. Interested professional readers may need to refer to more advanced texts on modeling and statistical methods in order to gain an in-depth understanding of particular subjects.

Uncertainty and how to represent it are the main topics of chapter 4. The contrast between point estimates and distributions of expected values is clearly exposed and well–illustrated with numerical examples. Elementary Bayesian methods and Monte Carlo re-sampling simulation techniques are described and applied.

The limited theoretical substance of the book is scattered in chapters 5 through 8, dealing with toxicology, epidemiology, exposure assessment, and technological risk. Concepts and tools of the trade for each of those disciplines (e.g. maximum tolerated dose, bioaccumulation, failure modeling using fault trees) are presented and explained using a variety of straightforward examples.

Chapter 9 is about decision making. It lays out the framework for examining risk perception and communication in chapter 10. Only an elementary version of decision trees and a couple of decision criteria are introduced and applied (maximum expected value in chapter 9, the *maximin* criterion in chapter 10). Chapter 10 explores issues of trust and credibility, perceiving and communicating risk, framing (e.g. how the problem is presented), and distributional issues (e.g. the right of government to allow one group to impose risks on another). Even readers with a wide range of experience may find chapter 10 particularly valuable. Those unacquainted with perception and communication issues may gain a nice introduction to the subject. In fact, I suggest the right order for reading this book is probably Introduction, chapters 1 and 2, chapter 10, and then the rest.

In spite of the contributions mentioned above, in my opinion the book falls short of expectations in some aspects. Notably: (1) there is an imbalance between a needed core of theory and the abundant application examples (maybe a reflection of a lack of paradigm?); (2) the chapters on uncertainty and decision analysis could be substantially improved by including and discussing issues of uncertainty propagation in models (e.g. probabilistic networks), where to get the numbers from (e.g. meta-analysis), and a more thorough treatment of decision analysis criteria and numerical problem solving techniques; (3) the number of errors and typos leaves you with the impression of a book written and edited in a hurry; (4) the review chapter on statistics (and also the Bayesian part of chapter 4) needs some improvement and corrections (e.g. confusion of parameters and estimators, incorrect formulas, confusion of priors and conditionals); (5) most examples and the treatment of the science-policy interface in chapters 9 and 10 are probably too US-centered; this restricts the potential for attracting an international readership.

Should you risk reading this book? Environmental professionals engaged in policy issues would certainly benefit from reading the book (particularly chapters 1, 5, 6, 7, 8 and 10). It may not be the right book, however, for readers looking for a risk modeling text including a precise treatment of the statistical number-crunching aspects involved in risk assessment.

The book would be appropriate as a text for a college-level course on risk analysis. With other supporting literature (particularly on modeling and decision analysis) it might also be useful for an introductory graduate-level course. There are some valuable insights contained in the book. Careful editing and revision of some chapters will certainly improve the text for a future edition. I would also suggest including a run-time version of any Monte Carlo software for facilitating the reader's exposure to uncertainty assessment techniques.

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